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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/765,578	01/26/2004	Robert A. York	22994-08791	8148

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EXAMINER	
IM, JUNGHWA M	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 06/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/765,578	YORK, ROBERT A.	
	Examiner	Art Unit	
	Junghwa M. Im	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 April 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 14 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 14 recites an unclear limitation, "the bottom electrode further comprises: an active portion including the active region, wherein the active portion comprise platinum; and a contact portion contacting the active portion, wherein the contact portion comprises gold." This limitation recites the embodiment in Figure 3, and the instant invention does not specifically disclose that the relationship between the current conducting perimeter of the bottom electrode and the active area recited in the claim 11 can be applied for this embodiment.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international

application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 5-7, 9 and 20-21 are rejected under 35 U.S.C. 102(e) as anticipated by Chakravorty (U.S. Pat. No. 6,383,858).

Regarding claim 1, Fig. 2A of Chakravorty shows a parallel plate varactor comprising:

a bottom electrode 105;

a top electrode 125;

a dielectric layer 110 sandwiched between the bottom electrode and the top electrode,

wherein a permittivity of the dielectric layer varies according to an electric field applied to the dielectric layer; the bottom electrode, dielectric layer, and the top electrode are integrated on a substrate 102; and an overlap between the bottom electrode, dielectric layer, and the top electrode defines an active region for the varactor; and

wherein, for at least one of the electrodes [the top electrode]:

a resistance of the active region that is significantly higher than that of a resistance of bulk region of the electrode;

the active region of the capacitor inherently possesses lateral area A, the electrode has a current conducting perimeter P; and a ratio R of the perimeter P to square root of the area is at least 2.0.

Regarding the aspect of resistance difference between the active area and bulk area, it is inherent or alternatively obvious that a resistance of the active region of the electrode is significantly higher that a resistance of bulk region of the electrode. Note that instant invention recites a bulk region is the portion of the electrode away from the active region.

Regarding the limitation of a ratio between the area and the conducting perimeter, Fig. 2A of Chakravorty shows the limitation over the specified ratio. If a length of one side of the square top electrode 125 is L, then the conducting perimeter is 4L and a square root of the area is L, thus the ration R is 4.

Regarding claim 2, Fig. 2A of Chakravorty shows the active region comprises at least one cell, each cell having a rectangular shape; and for each cell (col. 5, lines 39-44), the current conducting perimeter of the at least one electrode includes at least three sides of the cell.

Regarding claim 3, Chakravorty discloses that the dielectric layer comprises a ferroelectric thin film layer (col. 3, lines 33-37).

Regarding claim 5, Fig. 2A of Chakravorty shows a parallel plate varactor comprising:

a bottom electrode 105 ;

a dielectric layer 110 overlying a portion of the bottom electrode;

a top electrode 125 overlying a portion of the dielectric layer; and

wherein, for at least one of the electrodes:

an active region is defined by an overlap between the bottom electrode, the dielectric layer, and the top electrode;

a resistivity of the active region of the electrode is higher than a resistivity of a

bulk region of the electrode; and

the active region has an area A; the electrode has a current conducting perimeter P; and a ratio R of the perimeter P to a square root of the area A is at least 2.0.

Regarding the aspect of resistivity difference between the active area and bulk area, it is inherent or alternatively obvious that a resistivity of the active region of the electrode is significantly higher that a resistivity of bulk region of the electrode. Note that instant invention recites a bulk region is the portion of the electrode away from the active region.

Regarding the limitation of a ratio between the area and the conducting perimeter, Fig. 2A of Chakravorty shows the limitation over the specified ratio. If a length of one side of the square top electrode 125 is L, then the conducting perimeter is 4L and a square root of the area is L, thus the ration R is 4.

Regarding claim 6, Fig. 2A of Chakravorty shows the active region comprises at least one cell, each cell having a rectangular shape (col. 5, lines 39-44); and for each cell, the current conducting perimeter of the at least one electrode includes at least three sides of the cell.

Regarding claim 7, Chakravorty discloses that the dielectric layer comprises a ferroelectric thin film layer (col. 3, lines 33-37).

Regarding claim 9, Fig. 2A of Chakravorty shows the at least one electrode includes the bottom electrode 105; and for each cell, the current conducting perimeter of the at least one electrode includes at least four sides of the cell.

Regarding claim 20, Fig. 2A of Chakravorty shows a parallel plate capacitor comprising:

the bottom electrode 105;

a thin film dielectric layer 110 overlying the bottom electrode, wherein the dielectric layer comprises at least one of the materials selected from a group consisting of barium titanate, strontium titanate and barium strontium titanate (col. 3, line 34-35);

the top electrode 125 overlying the dielectric layer;

an active region is defined by an overlap between the bottom electrode, the dielectric layer, and the top electrode ;

the active region comprises at least two cells (145's); and

the active region has an area A; the bottom electrode has a current conducting perimeter P; and a ratio R of the perimeter P to a square root of the area A is at least 2.0.

Regarding claim 21, Fig. 2A of Chakravorty shows each cell comprises a polygon with N sides; and the current conducting perimeter comprises at least N-1 of the sides of each cell.

Claims 1, 3-5, 8, 10-13 and 15-19 are rejected under 35 U.S.C. 102(e) as anticipated by Zhu et al. (U.S. Pat. No. 6,377,440), hereinafter Zhu.

Regarding claim 1, Fig. 5 of Zhu shows a parallel plate varactor comprising:

a bottom electrode 64;

a top electrode 70;

a dielectric layer 76 sandwiched between the bottom electrode and the top electrode,

wherein a permittivity of the dielectric layer varies according to an electric field applied to the dielectric layer (tunable dielectric; col. 4, lines 13-15); the bottom electrode, dielectric layer, and the top electrode are integrated on a substrate 62; and an

overlap between the bottom electrode, dielectric layer, and the top electrode defines an active region for the varactor; and

wherein, for at least one of the electrodes [the top electrode]:

a resistance of the active region that is significantly higher than that of a resistance of bulk region of the electrode;

the active region of the capacitor inherently possesses lateral area A, the electrode has a current conducting perimeter P; and a ratio R of the perimeter P to square root of the area is at least 2.0.

Regarding the aspect of resistance difference between the active area and bulk area, it is inherent or alternatively obvious that a resistance of the active region of the electrode is significantly higher that a resistance of bulk region of the electrode. Note that instant invention recites a bulk region is the portion of the electrode away from the active region.

Regarding the limitation of a ratio between the area and the conducting perimeter, Fig. 5 of Zhu shows the limitation over the specified ratio. A region 82, an active region has a two parts divided by the dashed line. A portion left to the dashed line is a current conducting layer. Therefore, the active region of the capacitor inherently possesses lateral area A, the electrode has a current conducting perimeter P; and a ratio R of the perimeter P to square root of the area is at least 2.0. Also, note that Zhu discloses several embodiments which vary the ratio of the a current conducting perimeter P; and a ratio R of the perimeter P to square root of the area.

Regarding claim 3, Zhu discloses that the dielectric layer comprises a ferroelectric thin film layer (col. 5, lines 27-43).

Regarding claim 4, Zhu discloses the at least one electrode comprises a refractory metal (col. 5, lines 49-51).

Regarding claim 5, Fig. 5 of Zhu shows a parallel plate varactor comprising:

a bottom electrode 64 ;

a dielectric layer 76 overlying a portion of the bottom electrode;

a top electrode 82 overlying a portion of the dielectric layer; and

wherein, for at least one of the electrodes:

an active region is defined by an overlap between the bottom electrode, the dielectric layer, and the top electrode;

a resistivity of the active region of the electrode is higher than a resistivity of a bulk region of the electrode; and

the active region has an area A; the electrode has a current conducting perimeter P; and a ratio R of the perimeter P to a square root of the area A is at least 2.0.

Regarding the aspect of resistivity difference between the active area and bulk area, it is inherent or alternatively obvious that a resistivity of the active region of the electrode is significantly higher that a resistivity of bulk region of the electrode. Note that instant invention recites a bulk region is the portion of the electrode away from the active region.

Regarding the limitation of a ratio between the area and the conducting perimeter, Fig. 5 of Zhu shows the limitation over the specified ratio. A region 82, an active region has a two parts divided by the dashed line. A portion left to the dashed line is a current conducting layer. Therefore, the active region of the capacitor inherently possesses lateral area A, the electrode has a current conducting perimeter P; and a ratio R of the perimeter P to square root of the area is at

least 2.0. Also, note that Zhu discloses several embodiments which vary the ratio of the current conducting perimeter P; and a ratio R of the perimeter P to square root of the area.

Regarding claim 7, Zhu discloses that the dielectric layer comprises a ferroelectric thin film layer (col. 5, lines 27-43).

Regarding claim 8, Zhu discloses the at least one electrode comprises a refractory metal (col. 5, lines 49-51).

Regarding claim 10, Fig. 5 of Zhu shows the bottom electrode comprises platinum (col. 5, lines 2-3);

the dielectric layer comprises at least one of the materials selected from a group consisting of: barium titanate, strontium titanate, and barium strontium titanate (col. 5, lines 28-30); and

the top electrode comprises gold (col. 5, lines 48-51).

Regarding claim 11, Fig. 5 of Zhu shows a parallel plate capacitor comprising:

a bottom electrode 64;

a thin film dielectric 78 layer overlying the bottom electrode, wherein the dielectric layer comprises at least one of the materials selected from a group consisting of: barium titanate, strontium titanate and barium strontium titanate (col. 5, lines 28-30); and

a top electrode 70 overlying the dielectric layer;

wherein: an active region is defined by an overlap between the bottom electrode, the dielectric layer, and the top electrode; the active region comprises exactly one cell; and

the active region has an area A; the bottom electrode has a current conducting perimeter P; and a ratio R of the perimeter P to a square root of the area A is at least 2.0.

Regarding the limitation of a ratio between the area and the conducting perimeter, Fig. 5 of Zhu shows the limitation over the specified ratio. A region 82, an active region has a two parts divided by the dashed line. A portion left to the dashed line is a current conducting layer. Therefore, the active region of the capacitor inherently possesses lateral area A, the electrode has a current conducting perimeter P; and a ratio R of the perimeter P to square root of the area is at least 2.0. Also, note that Zhu discloses several embodiments which vary the ratio of the current conducting perimeter P; and a ratio R of the perimeter P to square root of the area.

Regarding claim 12 and 13, Zhu discloses that the bottom electrode comprises a refractory metal, platinum (co. 5, lines 2-3).

Regarding claim 15, Zhu discloses the ferroelectric thin film dielectric layer comprises barium strontium titanate (col. 5, lines 29-30).

Regarding claim 16, Zhu discloses the top electrode comprises gold (col. 5, lines 49-51).

Regarding claim 17, Fig. 5 of Zhu shows the active region comprises a polygon with N sides (N=4); and the current conducting perimeter comprises N-1 (3)of the sides.

Regarding claim 18, Fig. 5 of Zhu shows the active region comprises a rectangle having two long sides and two short sides; and the current conducting perimeter comprises the two long sides and one short side.

Regarding claim 19, Fig. 5 of Zhu shows a parallel plate capacitor comprising:

the bottom electrode 64 comprises platinum (col. 5, lines 2-3);

the ferroelectric thin film dielectric layer 76 comprises barium strontium titanate (col. 5, lines 29-31);

the top electrode 70 comprises gold (col. 5, lines 49-51);

the active region 84 comprises a rectangle having two long sides and two short sides; and the current conducting perimeter (a portion of 82 left to the dashed line) includes at least three sides of the rectangle.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhu in view of Toncich (US 6737930).

Regarding claim 14, Zhu fails to disclose that "the bottom electrode further comprises: an active portion including the active region, wherein the active portion comprises platinum; and a contact portion contacting the active portion, wherein the contact portion comprises gold. Toncich discloses a varactor wherein the bottom electrode further comprising an active portion including the active region, wherein the active portion comprises platinum (a cap); and a contact portion contacting the active portion, wherein the contact portion comprises gold (col. 2, lines 33-40).

It would have bee obvious to one of ordinary skill in the art at the time of the invention to have to incorporate the teachings of Toncich into the device of Zhu in order to have a gold bottom electrode covered with platinum to prevent oxidation as taught in column 2, lines 33-40 of Tocichi.

Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chakravorty in view of Zhu.

Regarding claim 22, Chakravorty discloses that each cell (145's) comprises a rectangle having two long sides and two short sides (col. 5, lines 39-41), however, fails to shows that "the current conducting perimeter comprises the two long sides and one short side of each cell." Fig. 5 of Zhu shows that a varactor comprises a rectangle having two long sides and two short sides and the current conducting perimeter comprises the two long sides and one short side of each cell.

It would have bee obvious to one of ordinary skill in the art at the time of the invention to have to incorporate the teachings of Zhu into the device of Chakravorty in order to have each cell of the varactor comprising a rectangle with two long sides and two short sides and the current conducting perimeter with the two long sides and one short side of each cell to adjust the voltage more easily.

Regarding claim 23, Fig. 2A of Chakravorty shows

the bottom electrode 110;

the ferroelectric thin film dielectric layer comprises barium strontium titanate (col. 5, lines 32-37);

the top electrode125;

each cell comprises a rectangle having four sides; and

the current conducting perimeter includes at least three sides of the rectangle, however, fails to show that bottom electrode comprises platinum and the top electrode comprises gold.

Fig. 5 of Zhu shows the bottom electrode comprises platinum (col. 5, lines 2-3) and the top electrode comprises gold (col. 5, lines 49-52).

It would have bee obvious to one of ordinary skill in the art at the time of the invention to have to incorporate the teachings of Zhu into the device of Chakravorty in order to have the bottom electrode comprising platinum and the top electrode comprising gold to utilize the readily available material.

Response to Arguments

Applicant's arguments filed January 26, 2004 have been fully considered but they are not persuasive. The rejection stands, modified only to accommodate the amendments made to the claims by Applicant. New rejections are made in response to Applicant amended claims.

Additionally, Examiner presents the remarks below in response to Applicant's arguments.

Applicant mainly argues that "In the top electrode 125 of Chakravorty, the current path is not laterally through the sides of the top electrode 125. Rather, it is vertically through the conductive vias 135. Thus, the current conducting perimeter, if any, is not 4L, as asserted by the Examiner, but is instead relatively small and the ratio R as defined in Applicant's Claim 1 is not "at least 2.0," as recited in Applicant's Claim 1." Examiner disagrees. Since the top electrode 125 of Chakravorty is a conductive metal, the current path of the top electrode is and has to be laterally through the sides of the top electrode when the current run vertically through the conductive vias 135. Therefore, the current conducting perimeter is 4L.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection for the added new clais presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's acting supervisor, Stephen Loke can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jmi

Steven Loke
Primary Examiner
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